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ZOOLOGY.—*Three new species and one new variety of amphipods from the Bay of Fundy*.¹ CLARENCE R. SHOEMAKER, U. S. National Museum.

While studying the amphipod material from the Bay of Fundy, which has been sent to the United States National Museum for identification by the Biological Board of Canada, I noted three new species and one new variety. These are now being described and the types deposited in the National Museum of Canada, Ottawa, Ontario.

HAUSTORIIDAE

Bathyporeia quoddyensis, n. sp.

Figs. 1, 2

According to the key given by E. Emrys Watkin (*A revision of the amphipod genus Bathyporeia Lindström*, Journ. Mar. Biol. Assoc. United Kingdom **23** (1): 234. 1938), for the identification of the species of *Bathyporeia*, this species should be *B. pelagica*. While these animals from Passamaquoddy Bay possess the characters he assigns to *pelagica*, they also possess characters that apparently do not belong to *pelagica*. Believing that the characters foreign to *pelagica* are sufficiently pronounced for the establishing of a new species, I am naming it *Bathyporeia quoddyensis*. Females only have been taken.

Female.—The entire animal is heavily pitted, and this pitting can be easily seen when the animal is stained with a dark stain. Eye small, light reddish brown in alcohol, and consisting of about six facets. Antenna 1, first peduncular joint distally rounding, three closely set spinules on the

upper, outer, proximal margin and about eight similar spinules continued along the upper margin and around the blunt distal end, a rounding protuberance bearing a few slender spines and three plumose setae at about the center of lower margin, a group of spines distally and three slender spines between the protuberance and end of joint; flagellum consisting of six joints; accessory flagellum without a tuft of setae on its outer margin. Antenna 2, fourth peduncular joint about twice as long as fifth; flagellum shorter than fourth and fifth peduncular joints combined and consisting of seven joints. Mouth parts about normal.

Gnathopod 1, coxal plate centrally constricted and expanded distally, lower and hind margins bearing a few spines; first joint equal in length to the fifth and sixth combined; sixth joint two-thirds the length of the fifth; seventh joint bears a seta proximally on the outer margin and a spinule distally on the inner margin. Gnathopod 2 much as figured by Chevreux and Fage (Fig. 86, gn. 2) for *pelagica*, but there are fewer spinules on lower margin of coxal plate, and the sixth joint is spatulate and not narrowly angular distally as shown in their figure. Peraeopod 1 is as shown by Fig. 2, C, the coxal plate bearing very few spines. Coxal plate 4 bears spines on lower margin and lower hind margin. Peraeopod 3 is as shown by Fig. 2, E. Peraeopod 4, second joint broadly expanded, with hind margin produced below into a broad rounding lobe. Peraeopod 5 somewhat as figured by Chevreux and Fage (Fig. 86, pr. 7) for *pelagica*, second joint broadly ex-

¹ Received June 6, 1949.

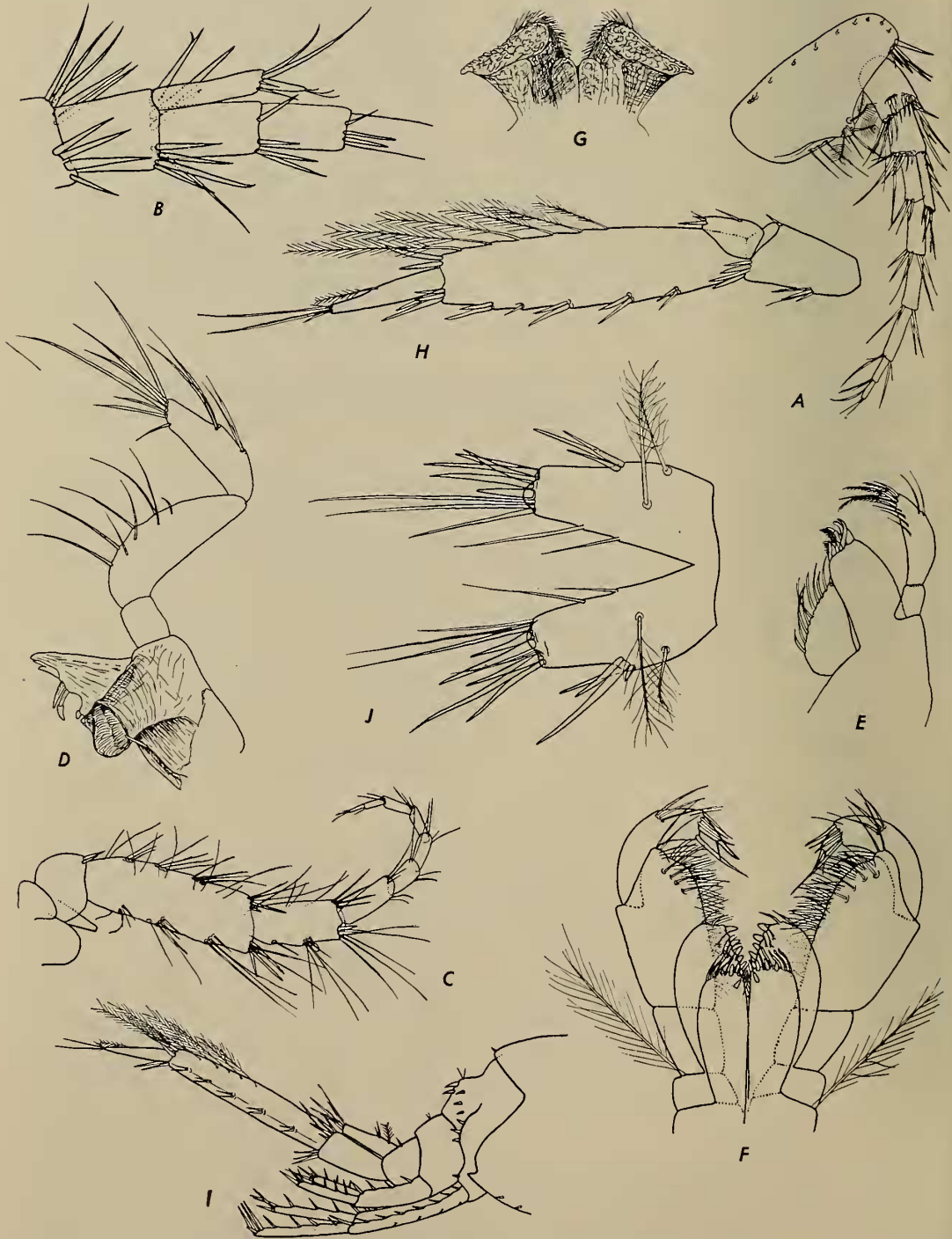


FIG. 1.—*Bathyporeia quoddyensis*, n.sp. Female: A, Antenna 1; B, antenna 1 enlarged showing the accessory flagellum; C, antenna 2; D, mandible; E, maxilla 1; F, maxillipeds; G, lower lip; H, uropod 3; I, hind end of animal; J, telson.

panded with the lower hind margin deeply excavate, whereas their figure shows only a small rather shallow excavation.

Uropods 1 and 2 rather long and slender, with spines as shown by Fig. 1, *I*. Uropod 3, outer ramus bearing groups of spines on outer margin and six plumose setae on distal half of inner margin of first joint; second joint with a single plumose seta on inner margin and a group of apical setae; inner ramus with a spinule on inner margin and two or three apically. Telson rather broad, cleft nearly to base, each lobe armed distally with a rather dense group of spines of varying length and thickness, lateral margins with a group of spines at the center, and inner margins bearing a few long slender spines. Each lobe bears on its upper surface a long plumose seta a little proximally of the center and a shorter plumose seta nearer the base.

The third metasome segment produced at the lower posterior corner into a rather prominent tooth above which the margin is markedly convex. The first urosome segment bears the usual dorsal depression and hump; the hump with two setae, posterior to which is a pair of stout backward-curving spines, and posterior to these still another pair of smaller spines. On the lateral side of this segment below the dorsal spines are three backward-curving spines. This segment curves upward from the first uropod forming a very low, flat, convex ridge bearing three spines. Length of female from front of head to end of third uropod from 4.5 to 5 mm.

Type.—A female taken inside West Quoddy Head, Maine, August 13, 1912, surface to 10 fathoms, fine sand, Biol. Board Canada no. 00410.

Besides the type, specimens were taken as follows: 1 specimen taken at Duck Pond, Campobello Island, August 13, 1912, 1–5 fathoms, sand, Biol. Board Canada no. 00408; 1 specimen in Bass River, Cobequid Bay, Minas Basin, September 12, 1921, surface; 1 specimen at Prince Station, no. 17, $\frac{1}{4}$ mile outside Bunker Island red light, Yarmouth Harbor, Nova Scotia, in 7 fathoms; and 2 specimens inside West Quoddy Head, Maine, August 13, 1912, 5–10 fathoms, Biol. Board Canada no. 00351.

Remarks.—The combination of characters that appears to distinguish this species is as follows: The protuberance on the under surface of the first peduncular joint of the first antenna; the considerable length of the fourth joint of the second antenna; the distally expanded first coxal

plate; seventh joint of first gnathopod with the seta on the outer margin proximally placed, and the spinule on the inner margin distally placed; last peraeopod with the second joint greatly expanded and the posterior margin considerably excavated below; first urosome segment with both dorsal and lateral spines; telson with spines on the inner margins of the lobes, and the dorsal plumose setae placed proximally to groups of lateral spines.

The present records are the first for the occurrence of the genus *Bathyporeia* in America.

STENOTHOIDAE

Metopella angusta, n. sp.

Fig. 3

Description of female.—Head with lateral lobes acute. Eyes small, round, and yellowish brown in alcohol. Antenna 1 slightly shorter than 2; peduncular joints decreasing consecutively in length and thickness; flagellum shorter than peduncle and composed of about seven joints. Antenna 2, fourth and fifth joints about equal in length; flagellum shorter than peduncle and composed of about seven joints. Mandible, cutting edge toothed, accessory plate finely toothed; spine row with five or six spines; palp very short, 3-jointed, third joint very short. Maxilla 1, inner plate bearing one distal spinule; outer plate armed with six spine teeth; palp 1-jointed and armed distally with teeth and setae. Maxilla 2, inner plate short and bearing five spines; outer plate with nine spines. Maxillipeds, inner plates rather prominent and united for nearly their entire length; outer plates very short and bearing five spines on inner margin; third joint of palp longest.

Side plate 2 twice as deep as wide, front margin very convex, hind margin nearly straight and bearing several short spines. Side plate 3 more than twice as deep as wide with sides slightly converging distally and hind margin bearing about eight short spines. Side plate 4 very nearly as deep as wide with front margin nearly straight. Gnathopod 1 simple, sixth joint very slightly longer than fifth and bearing about six slender spines on hind margin, which is very finely serrulate. Gnathopod 2 much stouter than 1; second joint longer than fifth and sixth combined; sixth joint with very oblique straight palm, which is very finely serrulate throughout, defined by a short slender tooth and two stout spines.

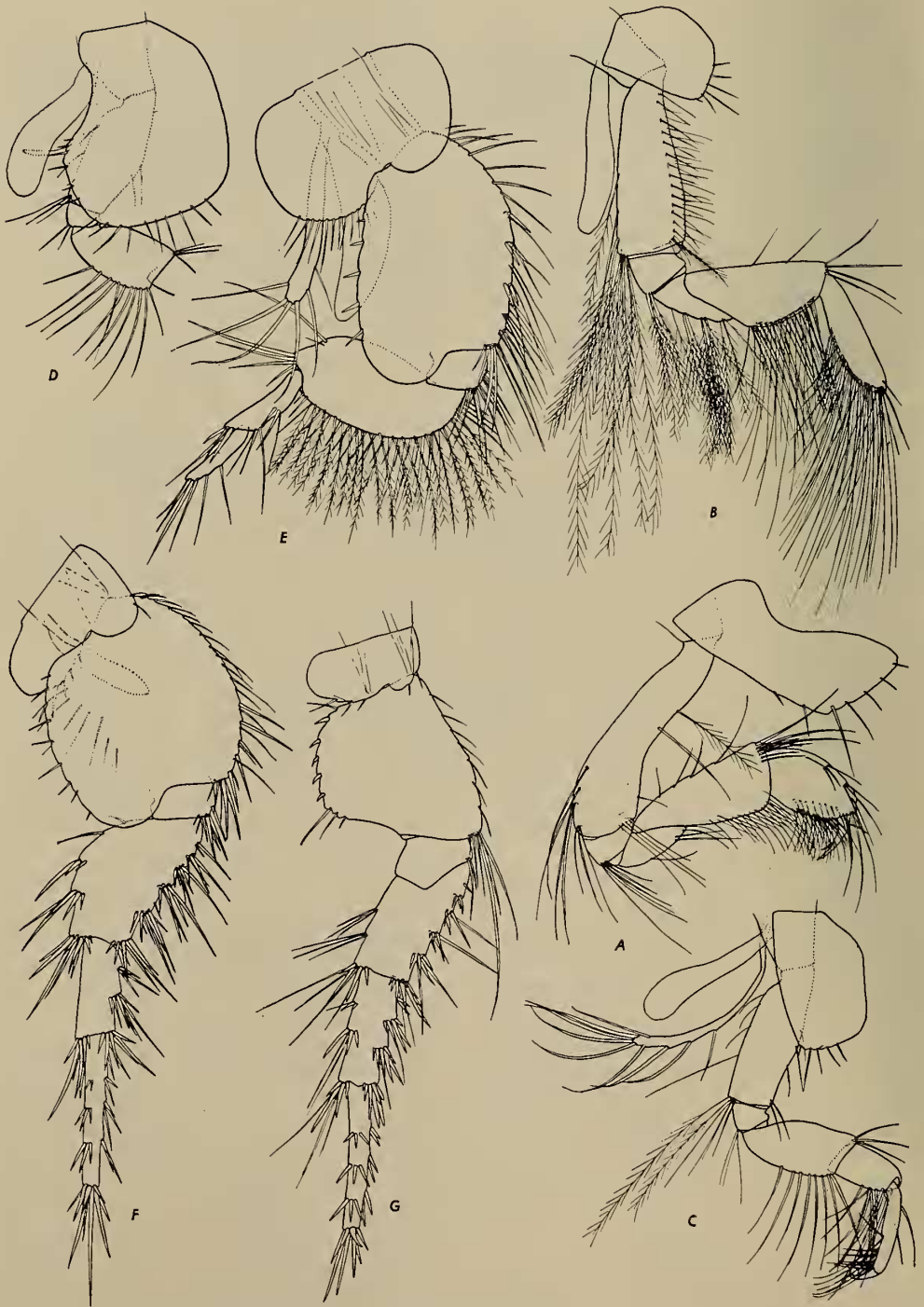


FIG. 2.—*Bathyporeia quoddyensis*, n.sp. Female: A, Gnathopod 1; B, gnathopod 2; C, peraeopod 1; D, peraeopod 2; E, peraeopod 3; F, peraeopod 4; G, peraeopod 5.

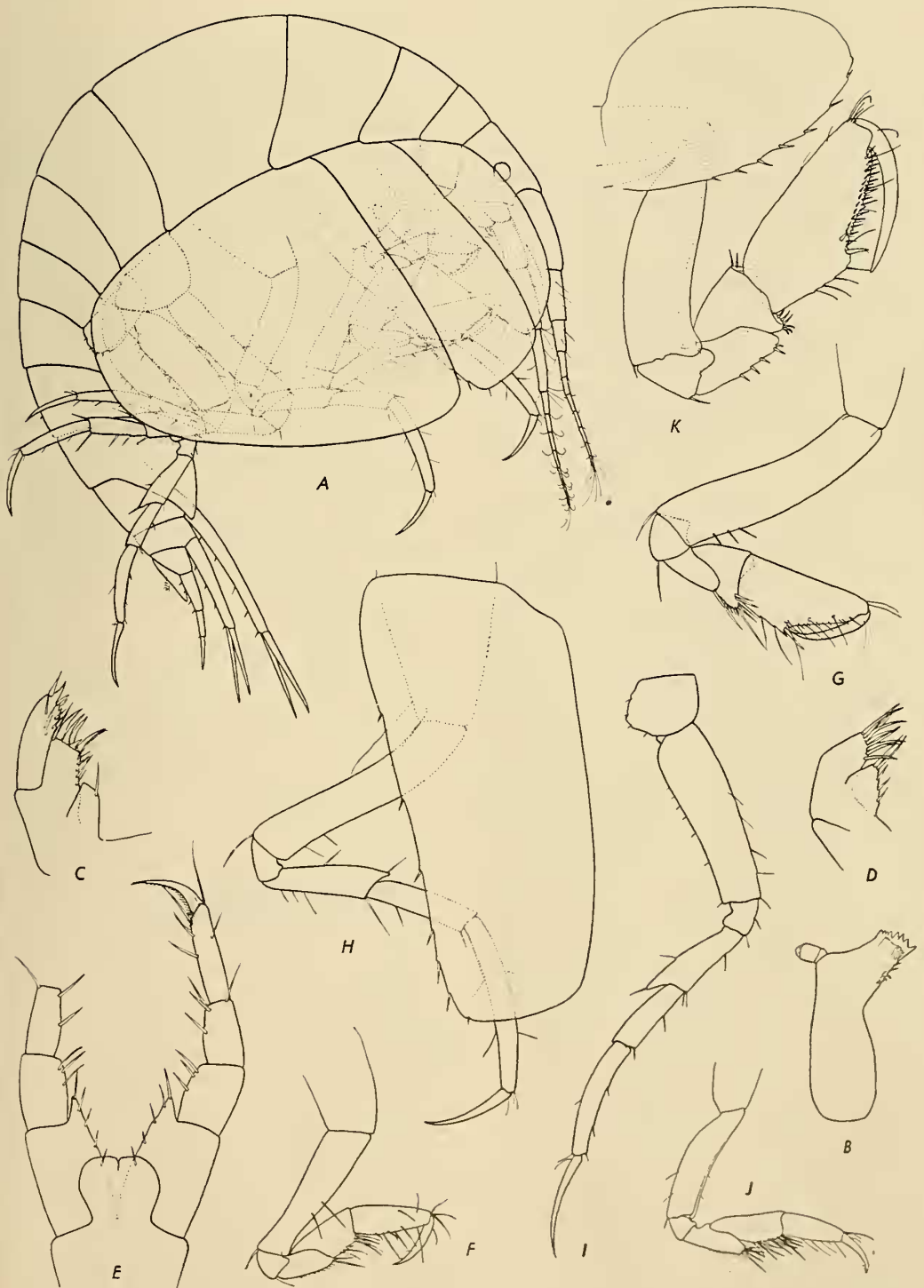


FIG. 3.—*Metopella angusta*, n.sp. Female: A, Entire animal; B, mandible; C, maxilla 1; D, maxilla 2; E, maxillipeds; F, gnathopod 1; G, gnathopod 2; H, pereopod 1; I, pereopod 5. Male: J, Gnathopod 1; K, gnathopod 2.

Peraeopods 1 and 2 subequal in length and thickness; fourth joint slightly expanded distally; sixth joint nearly as long as second; seventh joint in peraeopod 1 half as long as sixth joint, but in peraeopod 2 over half the length of the sixth joint. Peraeopods 4 and 5, second joint not expanded; peraeopod 4 shorter than 5, which in turn is shorter than 3; seventh joint of peraeopods 3 to 5 nearly as long as their respective sixth joint.

Uropods 1 to 3 decreasing consecutively in length, the upper edges of all the rami very finely serrulate. Telson without spines but bearing a plumose setule about the center of either lateral margin. Length of female about 3 mm.

Type.—A female from Duck Pond, Campobello Island, Bay of Fundy, August 13, 1912, 10 feet of water, fine clear sand, Biol. Board Canada no. 00516.

Description of male.—Antennae longer than in the female. Antenna 1, first and second peduncular joints long and slender and subequal in length; third joint about one-third the length of second; flagellum short and composed of about seven joints. Antenna 2, noticeably longer than 1; third, fourth, and fifth peduncular joints long and slender; fourth longer than fifth which in turn is longer than third; flagellum short, about as long as the fourth joint and composed of about seven joints. Gnathopod 1 much like that of female except that the fourth joint is produced forward partly under the fifth. Gnathopod 2 larger and stouter, and its side plate proportionately wider than in the female. The second joint of gnathopod 2 is produced distally into a short anterior lobe; the third joint also is produced into a short distal lobe; the fifth joint is produced below into a narrow, spinose lobe between the fourth and sixth joints; sixth joint twice as long as fifth, palm very oblique, about one-half the length of the joint, slightly convex, finely crenulate, and defined by a rounding protuberance bearing a stout spine. The palm is armed on the outside with short straight spines and on the inside with very short forward-pointing spines. In some specimens the palm bears at its center a tooth which is noticeably larger than the crenulations. The seventh joint is longer than the palm and reaches to the defining protuberance. In other characters the male agrees quite closely with the female. Length of male 3.5 to 4 mm.

Beside the type locality, Campobello Island, this species has been taken in the St. Croix River

opposite Robinson, New Brunswick, August 10, 1912, Biol. Board Canada no. 00508; and at Niger Reef, St. Andrews, New Brunswick, August 6, 1912, Biol. Board Canada no. 00478.

In the collection of the United States National Museum there are specimens of this species from *Fish Hawk* station 918, July 16, 1881 (lat. 40° 20' 24" N., long. 70° 41' 30" W.) off Marthas Vineyard in 44 fathoms; *Albatross* station 2261, lat. 40° 04' 00" N., long. 69° 29' 30" W., September 28, 1884, 58 fathoms; *Albatross* station 2497, lat. 45° 04' 00" N., long. 59° 36' 45" W., July 6, 1885, 57 fathoms. A specimen was taken by the *Albatross* in the Atlantic off Nova Scotia in 1885.

PLEUSTIDAE

Stenopleustes gracilis (Holmes)

Fig. 4

1903. *Apherusa gracilis* Holmes, Amer. Nat. **37**: 287.

1905. *Apherusa gracilis* Holmes, Bull. Bur. Fish. **24**: 495, fig.

1905. *Apherusa gracilis* Rathbun, *Fauna of New England*, 5, Orig. Pap. Boston Soc. Nat. Hist. **7**: 65.

S. J. Holmes (1905, p. 495) when describing this species placed it in the genus *Apherusa*. An examination of the mouth parts, however, appears to indicate that they conform much more closely to those of the genus *Stenopleustes*. As other external characters also agree quite closely with those of *Stenopleustes*, I am here transferring the species to that genus. I am redescribing and figuring the species in order to make it more easily recognizable. The sexes are so much alike that separate descriptions are unnecessary.

Description.—Head with rostrum broadly triangular and curving downward; lateral corners rounding, and lower angle not at all produced. Eye reddish brown in alcohol and longer than deep. Antenna 1 twice as long as 2; flagellum composed of many joints. Antenna 2, fourth joint of peduncle longer than fifth. Mandible with three spines in spine row; molar cylindrical and strong; third joint of palp longer than second. Maxilla 1, inner plate broadly truncate and bearing a single plumose seta; outer plate with six finely serrate spine-teeth; palp with five or six terminal spine teeth and three or four subterminal setules. Maxilla 2 normal, but without any prominent setae on inner margin of inner plate. Maxillipeds, inner plate rather short and broad with two terminal spinules and two low blunt teeth; outer plate without marginal spine teeth, but bearing a

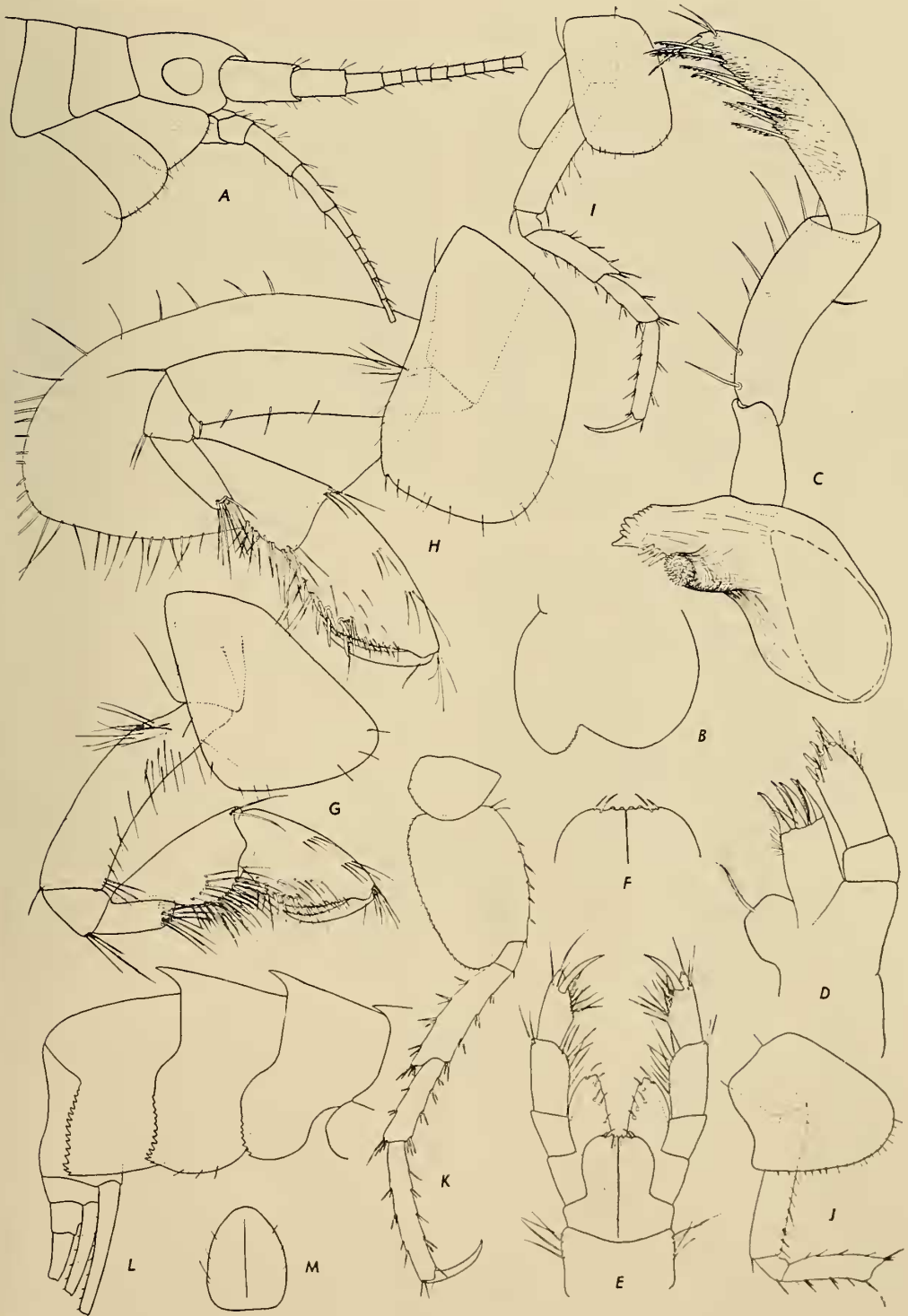


FIG. 4.—*Stenopleustes gracilis* (Holmes). Female: A, Front end of animal; B, upper lip; C, mandible; D, maxilla 1; E, maxillipeds; F, distal ends of the inner plates of maxillipeds; G, gnathopod 1; H, gnathopod 2; I, pereopod 1; J, pereopod 2; K, pereopod 5; L, hind end of animal; M, telson.

few submarginal spinules and one terminal spine; palp slender, third joint apically produced. Upper lip unsymmetrically bilobed, the smaller lobe with very fine teeth on inner margin. Lower lip normal and much as figured by Sars for *Stenopleustes malmgreni* (*Crustacea of Norway* 1: pl. 125, 1, 2).

Gnathopods 1 and 2 very much alike, but 2 somewhat the larger. Gnathopod 1, second joint nearly as long as the fifth and sixth combined; fifth joint as long and as wide as sixth, with lower margin broadly convex and spinose; sixth joint, palm evenly convex, finely serrate, and defined by several long spines; seventh joint fitting palm. Gnathopod 2, fifth joint shorter and narrower than sixth; sixth joint like that of gnathopod 1, but proportionally a little longer and narrower; seventh joint fitting palm. Peraeopods 1 and 2 slender and much alike, seventh joint rather long and slender. Peraeopods 3 to 5 with second joint expanded, succeeding joints slender.

Mesosome segment 7 and metasome segments 1 and 2 produced backward dorsally into a sharp tooth. Metasome segments 1 to 3 with lower posterolateral margin serrate. Uropod 1, inner ramus about as long as peduncle and a little longer than outer ramus. Uropod 2, inner ramus much longer than peduncle and nearly twice as long as outer ramus. Uropods 1 and 2 reaching back about the same distance. Uropod 3 not reaching back as far as 2, inner ramus about one-third longer than outer ramus. Peduncles of uropods 1 and 2 and rami of all uropods armed with very short spines. Telson a little longer than wide, deeply keeled and not reaching to end of peduncle of uropod 3. Length from front of head to end of uropods about 6 mm.

Holmes described this species from two rather imperfect specimens taken off Gay Head, Martha's Vineyard; and in his *Synopsis of North American invertebrates, XVIII: The Amphipoda* (Amer. Nat. 37: 287) he gives Cape Cod to Cape Hatteras as the range. In the collection of the U. S. National Museum I have not been able to find any specimens taken farther south than *Albatross* station 2261, lat. 40° 04' N., long. 69° 29' W. (off New Jersey). The species was taken at a number of stations in the Bay of Fundy by the Biological Board of Canada from 1912 to 1916.

Stenopleustes gracilis inermis, n. var.

This variety is like the typical form except that

it is somewhat smaller and lacks the dorsal teeth on the seventh segment of the mesosome and the first and second segments of the metasome.

The type, a female, taken at Wolves Islands, Passamaquoddy Bay, August 17, 1912, 20 to 30 fathoms, sand, mud, and shells, Biol. Board Canada no. 00444.

Other specimens were taken in the lower part of the St. Croix River and Passamaquoddy Bay in 1912 and 1913.

Remarks.—T. R. Stebbing in *Das Tierreich*, p. 309, characterizes the genus *Stenopleustes* as having only one seta on the inner plate of maxilla 1. *Stenopleustes eldingi* Gurjanova, however, has three setae on this plate, and so it seems the definition should be altered to one to three setae on inner plate of maxilla 1.

COROPHIIDAE

Unciola obliqua, n. sp.

Fig. 5

Male.—Head, rostrum triangular, lateral lobes not very large and distally rounding. Eyes on lateral lobes, but very indistinct as specimens had been in preservative a long while. Antenna 1 longer than 2; first joint of peduncle quite stout and nearly as long as second and third joints combined; second joint not quite twice as long as third; flagellum shorter than peduncle and composed of nine joints; accessory flagellum 1-jointed and reaching to about the middle of the first joint of the primary flagellum. Antenna 2, gland cone prominent; third joint rather stout and a little longer than the fourth joint; fourth joint stouter and longer than fifth joint; flagellum a little longer than the fifth peduncular joint and composed of five joints.

Mouth parts normal for the genus *Unciola*. Maxilla 1, inner plate small and bearing two setae on the broadly rounding upper edge; outer plate with nine spine teeth; palp with second joint long. Mandible with third joint of palp shorter than the second. Coxal plates 1-4 shallow, not contiguous and produced forward, the first narrowly and acutely so, 2-4 less produced consecutively. Fifth, sixth, and seventh coxal plates with the front lobe produced triangularly downward. Gnathopod 1, second joint short, stout, and very strong; fifth joint shorter but as wide as sixth; sixth joint widest distally, palm not very oblique, about as long as hind margin of joint, bearing a slight prominence about the center and

defined by a lobe bearing a stout spine which is preceded by a smaller spine; seventh joint stout and not overlapping palm. Gnathopod 2 slender; fifth joint longer than sixth; sixth joint narrowing distally; palm transverse, very short and defined by a slight lobe bearing a small apical spine; fifth and sixth joints provided with dense groups of long bristles.

Peraeopods 1 and 2 much alike and subequal in length; second, fourth, and fifth joints expanded and these together with the sixth joint bearing long slender spines on their hind margin; seventh joint with two spinules on inner margin. Peraeopod 3, second, fourth, and fifth joints expanded and fourth joint bearing many long slender plumose setae on the front and hind margin; fifth joint with two spines on hind margin; seventh joint with two spinules on inner margin. Peraeopod 4 much like peraeopod 3 but longer; second, fourth, and fifth joints expanded; seventh joint

with spinules on inner margin. Peraeopod 5, longer than 4; second joint expanded; fourth joint somewhat expanded; seventh joint nearly as long as sixth and bearing four spinules on inner margin.

Metasome segments 1 and 2 with lower hind corner narrowly and acutely produced backward; segment 3 with lower margin continued obliquely upward and backward to the point of attachment to the first urosome segment, thus lacking the acutely produced lower corner which is usual in the genus *Unciola*. Urosome segment 3 is so short that it is not discernible except ventrally at the attachment of the third uropods. Uropod 1, outer ramus a little over half the length of the peduncle, armed apically with the usual stout spines, and on the outer margin with three long slender spines; inner ramus reduced to a little over half the length of the outer ramus and bearing a single small apical spinule; peduncle rather flat and



FIG. 5.—*Unciola obliqua*, n.sp. Male: A, Front end of animal; B, antenna 1 enlarged showing the accessory flagellum; C, gnathopod 1; D, gnathopod 2; E, peraeopod 5; F, left uropod 1; G, left uropod 2; H, left uropod 3; I, left uropod 3 enlarged; J, hind end of animal. Female: K, Gnathopod 1.

broad and bearing a row of long slender spines on outer and inner margin. Uropod 2 bears only the outer ramus which is nearly as long as the peduncle; peduncle with a row of long slender spines on outer margin. Uropod 3 very short, extending very little beyond the telson, and bearing only a vestigial outer ramus armed with three long apical spinules. Telson broader than long, somewhat truncate distally and bearing a seta on either lateral margin. Length of male from front of head to end of uropods 5 mm.

Female.—The female is like the male except that the antennae and first gnathopod are not quite so strong. Gnathopod 1 is much like that of

the male, but the palm is more oblique, less sinuous and is not defined by a lobe. Length of female from front of head to end of uropods about 4 mm.

Type.—A male selected from several found in the stomachs of haddocks, nos. 58 and 62, taken by A. W. Needler in the Bay of Fundy.

Five females were taken by the steamer *Speedwell* (no. 141) in Gloucester Harbor, Mass., August 1, 1878, in 8.5 fathoms, and one male was taken by the *Speedwell*, no. 321, lat. 42° 03' N., long. 70° 15' W., in Cape Cod Bay, Mass., August 30, 1879, in 29.5 fathoms.

ZOOLOGY.—*Four new species of the acanthocephalan family Neoechinorhynchidae from fresh-water fishes of North America, one representing a new genus.*¹ HARLEY J. VAN CLEAVE, University of Illinois, and RALPH V. BANGHAM, College of Wooster. (Communicated by WALDO L. SCHMITT.)

In previous publications (Van Cleave, 1945, 1947, and in press; and Van Cleave and Manter, 1948) it has been demonstrated that speciation in the Acanthocephala has been significantly associated with speciation of fish hosts, particularly in North America. This parallel in evolutionary progress of parasites and their hosts has been especially conspicuous in the family Neoechinorhynchidae (class Eoacanthocephala, order Neoeacanthocephala). In this family diversification of its members has attained two entirely different levels. At the lower of these, by purely quantitative changes in the pattern of structure, distinctive species have evolved, while at the higher level differentiation of the parasites has gone so far that completely new qualitative features have become established. As a consequence, these forms are no longer recognizable as belonging to the original parent genus, since they have attained new structural expressions in features which taxonomists recognize as capable of reflecting generic differences. At the level of specific differentiation, the genus *Neoechinorhynchus* has undergone explosive speciation in the North American fauna so that at the present time ten species of this genus are known in the literature for this continent and three more are to be added in the present contribution.

At the generic level the differentiation of the Neoechinorhynchidae along with the evolution of the American fish fauna has resulted in the establishment of five distinctive genera previously recognized in the literature. These are *Octospinifer* in Catorhynchidae, *Eocollis* in Centrarchidae, *Atacatorhynchus* in Cyprinodon, and *Gracilisentis* and *Tanaorhamphus* in Dorosoma. To these is herein added the sixth distinctively North American genus of the Neoechinorhynchidae—*Paulisentis*, which occurs in the creek chub, *Semotilus atromaculatus atromaculatus* (Mitchill). *Paulisentis fractus*, genotype of the newly recognized genus, has been found in a very localized portion of the broad geographical range of the host species, in Wayne County, in the north-central part of Ohio.

At the specific level of differentiation, the three new species of the genus *Neoechinorhynchus* named and described in this paper include an additional distinctive species, *N. saginatus*, characteristic of the creek chub in Wisconsin; *N. tumidus*, apparently restricted to ciscoes and whitefishes of the Northern States and Canada as definitive hosts; and *N. doryphorus*, a peculiarly modified member of the genus as yet known from a single species of definitive host from Florida.

With the exception of some of the material of *N. saginatus* collected by J. Fischthal and some of the specimens of *N. tumidus*

¹ Received July 7, 1949.